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ABSTRACT

This guide is intended to assist workers in reducing their exposure to hazardous chemicals on the job. It describes a systematic preventive approach to hazardous chemicals that is based on the following steps: determining which chemicals are in use at a particular worksite (techniques for asking the company and steps to take if the company is unwilling to cooperate); identifying the short- and long-term health effects of different chemicals; assessing the seriousness of exposure (solid, liquid, and gaseous chemicals; ways in which chemicals enter the body; ways of determining how much exposure employees are receiving, and ways of identifying patterns of illness); methods of controlling exposure (control methods, personal protective equipment, and Occupational Safety and Health Administration [OSHA] policy on personal protective equipment). Appendixes include a chemical hazard inspection checklist, a table of glove permeability, a form for use in requesting that a company supply information under OSHA, and comments on the degree of protection afforded by OSHA standards. An annotated resource list is also provided. (MN)

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Hazardous Chemicals on The Job:
A Workers Guide to Reducing Exposure

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This work was developed, relying heavily on two publications:

The Hazards of Work by David Clement, Highlander Research and Education Center, Newmarket, TN.

An Introduction to Occupational Health and Safety, Ontario Federation of Labour.

CONTENTS

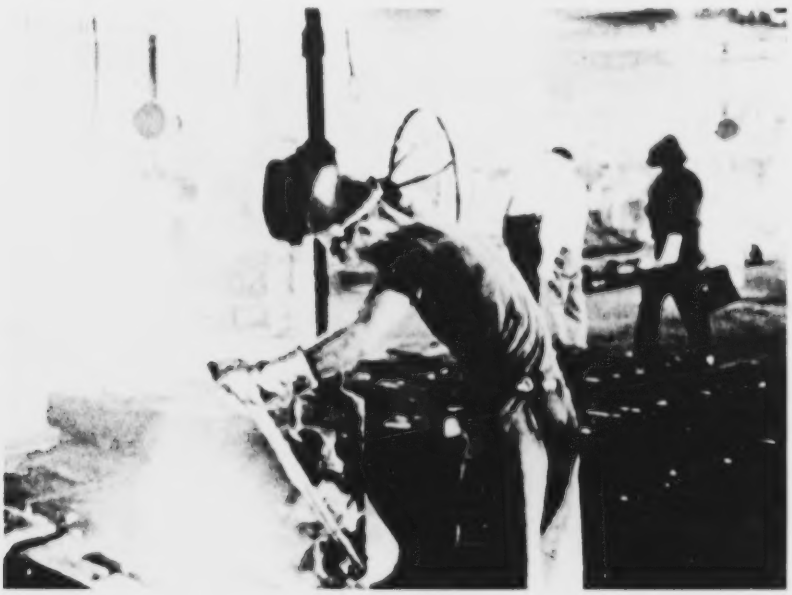
	Page
Can you do better than reacting to disease?	1
What chemicals are in use?	3
1. First ask the company.	
2. What do you do if the company says no?	
What can the chemicals do to you?	7
1. What types of health effects do chemicals have?	
2. Will they affect you today or when you retire?	
How serious is the exposure?	11
1. Solid, liquid or gas?	
2. How does the chemical get in the body?	
3. How much exposure are you getting?	
4. Are there any patterns of illness?	
How can exposure be controlled?	17
1. Control methods for chemicals from best to worst	
2. Personal protective equipment: solution or problem?	
3. What is OSHA's policy on personal protective equipment?	
A preventive approach	21
Appendices	23
1. Chemical Hazard Inspection Checklist	
2. Table of Glove Permeability	
3. Request to Company for Information Under OSHA	
4. Comments on OSHA Standards: How protective are they?	
Resource List	27

Can you do better than reacting to disease?

Alert union representatives often respond to complaints of headaches or other symptoms by looking into chemicals on the job. Yet many chemicals — like asbestos — have no immediate effects and may be overlooked. The only way you can be sure that such "timebombs" are not ticking away in the workplace is to look into the chemicals in your locations until you can answer these questions:

- What chemicals are in use?
- What can they do to you?
- How serious is the exposure?
- How can exposure be controlled?
- Better yet, can exposure be prevented?

This booklet should help you answer these questions and decide what steps to take. The goal is a **systematic preventive approach** to hazardous chemicals.



Multigraphics
Multilith
Deglazing
Solvent
83-7-788001
matone

What chemicals are in use?

1. First ask the company.

Rarely are workplace chemicals labeled with more than trade names like "Safety Solvent" or just code numbers. But you need chemical names to find out about a chemical. Some companies tell you chemical names if you ask, but most refuse, with excuses like protecting trade secrets or assurances that their chemicals are safe.

2. What do you do if the company says no?

a. Use your rights. You have some rights which can help get information. The OSHA Standard 1910.20 allows you access to and copies of any exposure records the company has, including air sampling results, Material Safety Data Sheets (MSDSs) or any records which reveal chemical or trade names of hazardous substances in the workplace. The Standard does not however require the company to generate any exposure records it does not already have. A sample letter requesting such information is included as Appendix 3.

   In addition, unions can demand chemical identification information under the National Labor Relations Act. Section 8(a)(5) of the NLRA spells out the employer's duty to provide upon request information that is relevant and necessary to allow the Union to bargain and represent workers intelligently and effectively with respect to wages, hours and working conditions. If the company refuses to provide the information requested, you can file an 8(a)(5) charge against the employer with the NLRB. Recently the Oil, Chemical and Atomic Workers and the International Chemical Workers have won such cases. Employers have challenged the rulings, however, tying the request up in the courts.

b. Try to find out the product name, code number, manufacturer's name and address and warning (if any) from the label. Workers in Purchasing or Shipping and Receiving may be able to help.

c. Write or call the manufacturer and request a MSDS. The information on the MSDS is often inadequate for your needs, as illustrated by the example on the next page which fails to identify the chemical ingredients. The second example shows a useful MSDS. Sources of factsheets (not put out by manufacturers) may be found in the *Resource List* at the end of this booklet.

d. Request help from the National Institute of Occupational Safety and Health (NIOSH). They have a collection of MSDSs by trade name. If you have the chemical name, they will answer requests on health

Example of a poor MSDS

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

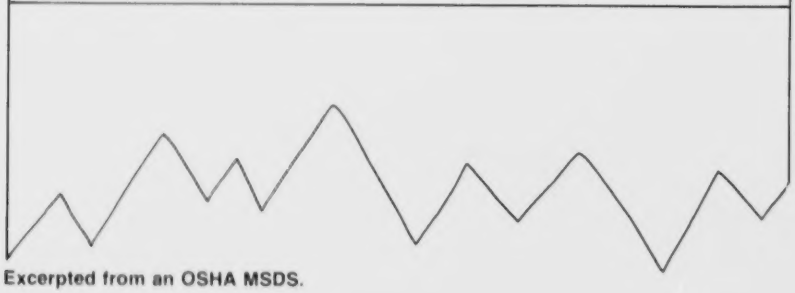
Form Approved
OMB No. 44-R1387

SECTION 1

MANUFACTURER'S NAME	FISKE BROTHERS REFINING CO.
ADDRESS *(Number, Street, City, State and ZIP Code)*	
EMERGENCY TELEPHONE NO.	201-589-9150
CHEMICAL NAME AND SYNONYMS	Chemical Coolant
TRADE NAME AND SYNONYMS	Fiske's Metsol
CHEMICAL FAMILY	
FORMULA	Water mixture of soap and additives

SECTION V — HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE	May cause drying of the skin
EMERGENCY AND FIRST AID PROCEDURES	Wash hands and apply skin cream



Excerpted from an OSHA MSDS.

Example of a useful MSDS

MATERIAL SAFETY DATA SHEET CORPORATE RESEARCH & DEVELOPMENT SCHENECTADY, N. Y. 12305 Phone: (518) 385-4085 DIAL COMM 8*235-4085	NO. 312 TRICHLOROETHYLENE Revision D Date July 1979

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: TRICHLOROETHYLENE
OTHER DESIGNATIONS: TCE, Ethylene trichloride, Ethenyl trichloride, $CHCl-CCl_2$, CAS # 000 079 016
MNFCTR & TRADE NAMES: BLACO-TRI (Baron-Blakeslee); ALK-TRI, HI-TRI (Dow); TRICLENE D & MD (Diamond Sharmock)

SECTION VI. HEALTH HAZARD INFORMATION TLV 100ppm, 535mg/m^3

Inhalation above TLV can irritate nose & throat, with dizziness, drowsiness, headache, nausea, unconsciousness & death if excessive exposure. Vapor or liquid can cause eye irritation & tearing; Skin contact causes irritation & dermatitus if prolonged or repeated. Ingestion irritates digestive tract and may cause nausea & rapid drowsiness, partial paralysis & kidney failure.

FIRST AID:

Eye contact: wash immd'ly, plenty running water, get prompt medical attention.
Skin contact: Remove contaminated clothing; wash with soap & warm water.
Inhalation: Remove to fresh air, Advise MD not to give adrenalin.
Ingestion: Get Immed. medical help! Warn MD not to use adrenalin.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Inform safety personnel and evacuate area for large spills. Clean-up personnel should use respiratory and liquid contact pr[illegible]tion. Provide ve[illegible]ilation. Co[illegible] spi[illegible] to a[illegible] an area as po[illegible]e. D

Excerpted from a General Electric Company MSDS.

effects information. Contact: NIOSH, Information and Analysis Section, Mailstop C-19, 4676 Columbia Parkway, Cincinnati, OH 45226 (513) 684-8328.

e. Request help from OSHA. An OSHA industrial hygenist may be able to help you. Call the Area Office nearest you or the Region III office in Philadelphia (215) 596-1201, or the OSHA library ("Technical Data Center") in Washington, D.C. (202) 523-9700.

f. The Workers' Institute for Safety and Health (WISH) has a computerized file of information called HAZALERT. They will look up health and safety hazards, information of safe handling and relevant regulations on chemicals, on request from a union. Union representatives can write WISH, 1126 16th St., N.W., Washington, D.C. 20036, or call (202) 887-1980.

g. Try to get a clause in your contract which will give workers the right to know the chemical names of substances in the plant.

h. Many locals have successfully used tactics such as leaflets and media. Some have found labels which say "What is this stuff? We have a right to know" which stuck on vats containing unknown chemicals helped encourage workers to get involved.

i. If you can get small samples of unknown substances, you can have a laboratory analysis performed to find out what they are made of. This tactic may be relatively costly. It is recommended that you use a lab which has been approved by the American Industrial Hygiene Association to be sure results are accurate. A list of these labs is included in the *Resource List*.

j. Some locals have tried using the company's insurance company to pressure the company to lower exposures. Some insurance companies have industrial hygiene departments which will come and measure chemical exposure.

What can the chemicals do to you?

1. What types of health effects do chemicals have?

Substances may be categorized according to the type of injury they produce, although many substances produce several different effects at different locations in the body, and thus may fall into more than one of the categories listed below. The type of effect may depend on concentration.

a. **Toxic Substances (Poisons):** This is a general term which some people would say includes all the effects listed below, plus other specific effects on the body. It is often used to refer to any substance which damages cells or other structures in the body or interferes with some body process.

b. **Irritants:** These are the gases, dusts, fumes and mists which cause pain and reddening of the exposed area, most often the eyes, skin and respiratory tract. Effects are usually seen immediately, but the result of chronic irritation may be the formation of scar tissue or other permanent changes. Irritant substances include gases such as ammonia, ozone, and chlorine, and the dusts of fiberglass and beryllium. Almost all solvents and their vapors are strong irritants.

c. **Corrosives:** These cause rapid death of cells on contact. Exposure can cause pain, burning, bleeding or fluid loss.

d. **Asphyxiants:** Gases like acetylene and carbon dioxide in high concentration replace oxygen in the air. The result is asphyxiation or smothering.

e. **Sensitizers (Allergens):** Some substances react with the body's immune system to produce a delayed type of irritation known as an allergic reaction. The result may be a skin rash or a wheezing condition similar to asthma. A chemical known as a toluene di-isocyanate (TDI), used in the manufacture of plastics and foams, causes asthma-like breathing difficulties in about 5% of people exposed to its vapors. Substances like coal tar and pitch sensitize the skin to the effects of sunlight.

f. **Carcinogens:** These are chemicals which cause uncontrolled growth of cells, or cancer, by causing changes in the genetic material of cells. Although little is known about how cancer-causing substances exert this type of effect, laboratory tests using animals and bacteria can often identify carcinogens.

g. **Mutagens and Teratogens:** Mutagens cause changes in the genetic material of cells but not necessarily cancer. Mutagens may affect the

sperm and eggs leading to inherited defects. Teratogens exert their effect on the cells of the developing fetus in the womb. The end result of either, can be still-births, miscarriages and birth defects.

Any particular substance can react with the body in more than one way. There are many examples of workplace pollutants which have irritant effects at the surface they first contact, but also enter the circulation and cause poisonous or carcinogenic changes in other body systems. Cadimum fumes for example harm the lungs and may cause kidney damage or prostate cancer much later.

2. Will they affect you today or when you retire?

As mentioned above, many chemicals (like asbestos) have serious delayed effects without early warning signs. For others, symptoms may be a clue of more serious problems to follow. The effects of chemicals are often classified by how quickly they occur:

a. **Acute Effects:** (Such as coughing or irritations of skin or nose.) An acute reaction is one that occurs as an immediate response to exposure. Effects are usually obvious and short-lived. They may be followed by recovery or sometimes by permanent damage.

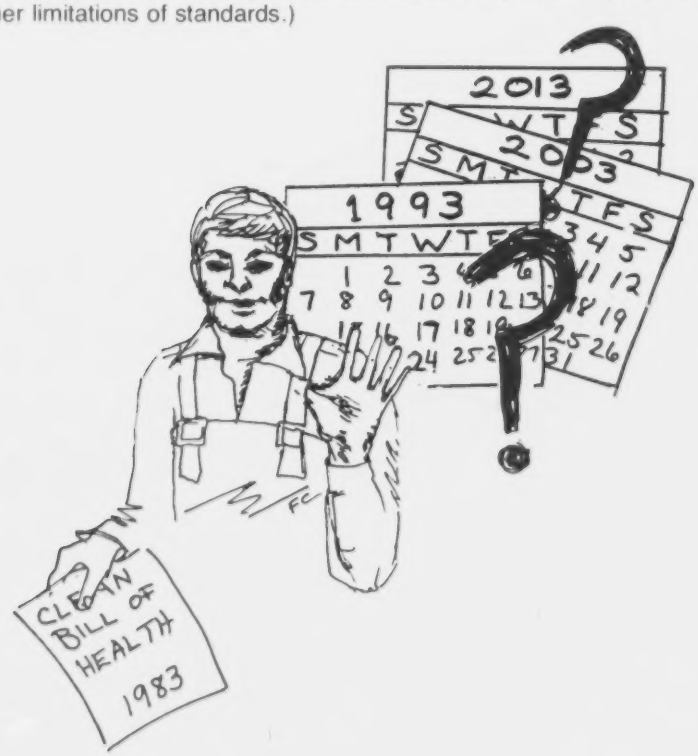
b. **Chronic Effects:** (Such as cancer or kidney disease.) Strictly speaking, this term means long-lasting health effects, but it is usually used to mean delayed (as opposed to immediate) effects. Often delayed effects are long-lasting (hence the confusion in the use of the word).

Some chemicals, notably carcinogens, may produce disease 30 years or even longer after initial exposure. The interval between exposure and disease is called the latency period. For some of these chemicals, such as asbestos, even a small exposure, followed by an exposure-free latency period, may result in disease.

Other chemicals cause harm after repeated low-level exposures. Some, such as solvents, cause repeated injuries, the effects of which build up even though the chemical leaves the body. Others, including cadmium and lead, accumulate in the tissues, causing more damage as they build up.

An example showing the difference between acute and chronic effects is alcohol: the acute reaction is drunkeness. The chronic effects may include alcoholism and liver damage.

The distinction is vital to understanding hazards of workplace chemicals. Chronic and acute effects may be very different, and protecting against one may not protect against the other. *Remember that OSHA standards usually are designed to protect against acute effects only.* (See Appendix 4 for other limitations of standards.)



Here are some examples of ways in which acute and chronic effects can differ:

- Some chemicals have no acute effects. It may be years after exposure before chronic effects become visible. Often it is too late to deal with the problem then. Asbestos is a good example. Acute reactions are minimal (perhaps a dry, dusty throat). Chronic effects can be catastrophic, including asbestosis — the permanent loss of lung capacity — and possibly cancer. Many industrial chemicals behave in this way, adverse effects emerging only after years of use.
- Some substances have both acute and chronic effects, but the acute effects occur at much higher concentrations than the chronic ones. So setting a limit to control acute reactions alone may not offer protection against chronic ones. An example is vinyl chloride monomer (see box below).
- The doses of alcohol needed to cause chronic effects are substantially more than those needed to create acute reactions. Unlike control of most workplace chemicals if you limit the dose to control immediate visible effects you also eliminate chronic ones.

Many workplace chemicals may have well-documented "acute" effects. But the long-term "chronic" effects may be unknown and may only be uncovered by the appearance of long-term damage to workers in the future. So many workers are in effect guinea pigs.

So when union representatives ask for information about health effects, they must ask for details of both chronic and acute ones.

Vinyl chloride monomer (VCM) is used to make the plastic polyvinyl chloride (PVC). The acute effects of VCM were identified in the 1930s — it had a "narcotic" effect, or caused drowsiness. Experiments were then carried out to use it as a medical anesthetic. To prevent this narcotic effect in industry, the threshold limit value (TLV) was set at 500 parts per million (PPM) in 1962.

But further research on animals showed that VCM affects the liver, bones and kidneys, and the TLV was reduced to 200 PPM in 1971. In 1974 a company announced that three of its workers exposed to VCM had died of liver cancer. Since then, the OSHA Standard has been radically reduced to its current level of 1 PPM (8 hour time-weighted average).

How serious is the exposure?

Once you know what a chemical is and its main effects on the body, you need to take a look at the details of how people are exposed in your workplace. This will help you decide about the seriousness of the problem, and what the best control methods are. For example, if the chemical is a solvent, workers may be getting it on their skin, or into their bodies through their skin; proper gloves may be all that is needed. If the solvent is hot or volatile, however, they may breath in its vapors, a problem which would require improved ventilation.

1. Solid, liquid, or gas?

The "form" of a substance influences how it can get into the body, and what damage it can cause. This form can change during the production process. The main forms of materials are:

a. **Solids.** Unless they are in dust or fume form, these are unlikely to cause harm — though some may contaminate skin or food. The main danger from solids is that they can change form while being worked. Wood can be turned into wood dust, which can be breathed. Welding rods can decompose into fumes and gases. Another example is "teflon" used in "non-stick" pans. In its solid form it is harmless. When heated intensely (as by machining) it can decompose to form poisonous gases. Polyurethane foam is safe in its normal form, but when it burns it gives off deadly gases.

   1. *Dusts* are tiny particles of solids. They may be brought into the workplace as dusts (e.g. bags of cement) or they may be created by work processes (e.g. grinding or pulverization). In either case the main danger from harmful dusts is that they may be breathed into the lungs. Larger particles are usually trapped by hairs and mucus in the nose and windpipe, where they can then be expelled. But smaller particles ("respirable dust") may be breathed in deeply and could damage the lungs or enter the rest of the body by passing from the lungs to bloodstream. Clouds of tiny dust particles often cannot be seen except with special lighting. Under certain conditions dust can also explode (as in grain silos).
   2. *Fumes* are formed when a solid is heated so hot it vaporizes (to a gas), then solidifies in the cooler air to fine solid particles which can be inhaled. Welding causes the metal of the rod and the piece being welded to form fumes.

b. **Liquids.** Many hazardous substances are liquids at normal tempera-

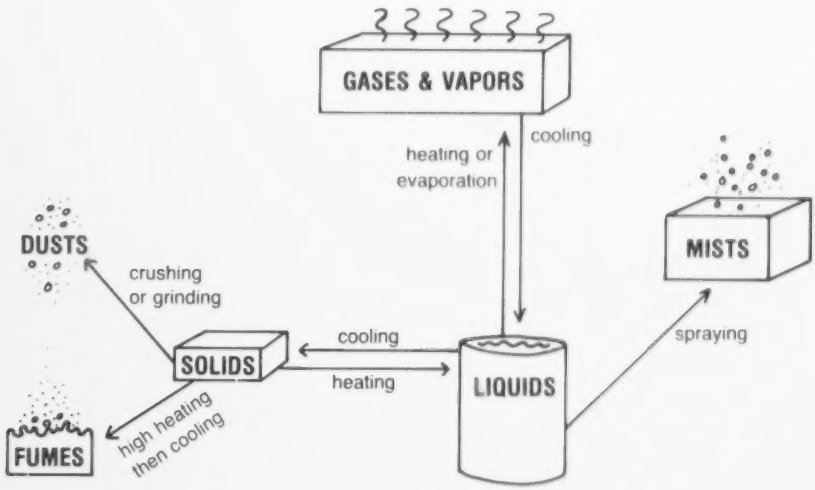
tures. Examples are acids and solvents. Some liquids can damage the skin while others are able to pass right through the skin and enter the body. Many liquids give off vapors (evaporate) which can be breathed into the lungs.

1. *Mists* are fine droplets of liquid suspended in air. They can be formed by a spraying operation.

c. **Gases.** Some substances are gases at normal temperatures (such as sulfur dioxide and carbon monoxide); others are solids or liquids which become gases when heated. Some are easy to detect, having color or smell, others are colorless and odorless and can only be detected with instruments (carbon monoxide). Some have immediate irritant effects; others have effects which may only become evident after considerable damage has been done. Gases may also be flammable or explosive.

1. *Vapors.* Many liquids evaporate (to a vapor) at room temperature; all evaporate faster when heated. The term "vapor pressure" indicates the speed at which a liquid evaporates. If a liquid is toxic, then it is more dangerous if it has a high vapor pressure, as it will become airborne (and breathed) more rapidly. Some vapors are flammable or explosive. The term "flash point" indicates the liquid temperatures at which the vapor can be ignited by a spark. The lower the flash point, the more flammable the liquid. In addition to toxicity and flammability, vapors may be skin or eye irritants.

The following diagram illustrates how chemicals may change from one form to another due to processes (as heating, grinding, spraying, etc.):



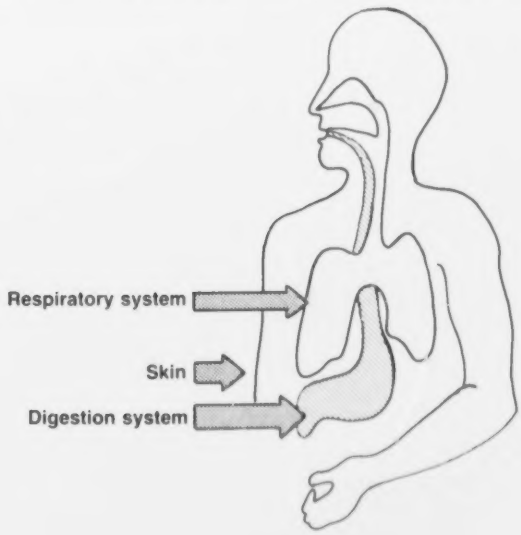
2. How does the chemical get in the body?

There are three ways in which toxic substances can get into the body. Often a substance can get in by more than one route. Union representatives should inquire about this because it will help identify potential problems and suggest solutions. The three main routes are through:

a. **The Lungs.** This is by far the most common way in which harmful chemicals get into the body at work. Dusts, gases and vapors can all be inhaled. While a good deal of inhaled matter is breathed out again immediately, some part may remain. There it may damage or irritate the lung itself (for example acids may corrode tissues, while silica or asbestos may cause the lungs to produce scars), or it may be absorbed into the bloodstream to be carried to other organs where damage occurs. Because breathing is so important as a route of contamination, the campaign for clean air at the workplace is a vital part of the fight against health hazards.

b. **The Skin.** Some substances (such as acids) may attack the skin directly. These are often called "corrosive." Some irritate (such as certain cutting oils) and can cause dermatitis and possibly skin cancer after prolonged exposure. Other substances (such as phenol or nitrobenzene) easily penetrate the skin and enter the bloodstream. So it wouldn't be enough to measure the airborne concentration of phenol — you would have to check for skin contact as well.

c. **The Digestive System.** This route is less common, but can occur through eating or smoking in the presence of contaminants. So any workers involved with toxic materials should be provided with adequate washing facilities and separate eating facilities.



Some substances have different effects depending on how they reach the body. For example, the solvent trichloroethylene has more immediate and serious effects when swallowed than when its vapor is breathed.

So union representatives should ask three basic questions when getting information about any chemicals:

- **What is the basic form?**
- **Does the form change in use?**
- **How can the substance (in its various forms) get into the body?**

3. How much exposure are you getting?

Sometimes workers are exposed to huge quantites of a chemical all day long. Other times there is a smaller exposure, or a less frequent one. The importance of the amount of exposure depends on the types of effects of a chemical. For example if the chemical only has acute effects, such as zinc oxide fume is thought to have, then reducing exposure to below the level at which discomfort is felt, is adequate protection. But if the chemical is known or suspected of having chronic effects, then the best course is to eliminate or at least minimize exposure.

If the chemical is in the air, the only way to know how much there is, is to measure it with sampling equipment. Workers should compare measured levels to the OSHA Standard when there is one. If the company has done any sampling, workers have the right to see the results, and get copies of them, under OSHA Standard 1910.20 (see page 3).

Last, it is important to look at protections already available. For example, is there already good ventilation or appropriate protective clothing? You need to find out if affected workers are aware of and practicing safe work practices, such as wearing protective gear and using safety equipment.

Questions union representatives can ask include:

- How much of the chemical is in the air?
- How often and how long are workers exposed to it?
- Will repeated low level exposures have harmful effects?
- What existing work practices and controls are already there?

4. Are there any patterns of illness?

Union representatives may start with a complaint about headaches, or skin rashes, or may discover such problems by asking questions. Sometimes clues about chemicals come from patterns of ill effects: several workers are having the same symptoms in one department; or headaches are worse on Mondays. By asking questions of workers on the job, and also workers who used to work a particular job, patterns may be uncovered.

Often management will try to convince you that problems you have such as fatigue, memory loss or irritability, are due to problems at home or to aging. It is important to decide for yourself if problems are occupational or not. Union representatives can ask workers about other possible exposures off the job or other health problems.

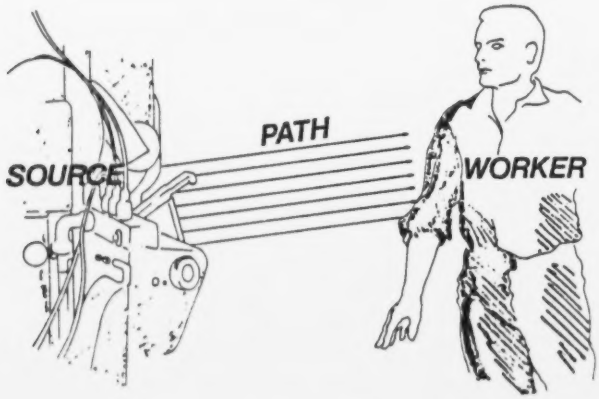
Questions union representatives can ask include:

- What symptoms are present in a particular area? Other areas?
- Are people in certain areas experiencing problems without symptoms, detected by their doctors, such as liver malfunction?
- Do headaches, irritation or other symptoms come and go at particular times of day or days of the week? Do they clear up on vacations?
- What off-job exposures or health problems could cause symptoms?

Be sure to include workers retired or transferred when possible.

How can exposure be controlled?

The purpose of control measures is to eliminate the hazards the workplace presents to the worker. You can conveniently consider the measures from the point of view of where that control is exerted: (1) at the source: (2) along the path to the worker; (3) at the worker. This is a useful approach since, in general, the further from the source, the less desirable or effective is the control.



Drawing: Ontario Federation of Labour

1. Control methods for chemicals from best to worst.

a. Control at the source.

1. *Substitution* — Can a different chemical be used which is safer? A common example of substitution is using toluene instead of benzene. Make sure, however, that the new substitute is proven to be safer. Or can the same material be used in a different form? Many times dusty powders are also available in bricks which do not create dust when handled.
2. *Change the Process* — Can the job be done in a completely different and safer way? An example is using a detergent or steam cleaning instead of using an organic solvent. Or a variation on this theme is using the so-called "wet methods" of control to eliminate

or control irritating dust. Water has commonly been sprayed over a dusty operation or mixed with the material to form a slurry to prevent dust from being created.

3. *Mechanize the Process* — Is automating an operation the best answer to a dangerous job? An example is using an automatic parts dipper on a vapor degreaser rather than manually dipping parts into the tank.
4. *Isolate the Process* — Can the hazardous job be removed to a different part of the plant where fewer people are exposed? Or done at a different time such as on a weekend or on the midnight shift? As an alternative, can the worker be isolated from the general operational area by placing him in an air-conditioned control booth?

b. Control along the pathway.

1. *Enclose the Operation* — Can the process be completely enclosed to keep the hazard from reaching the worker? An example is splash guards and hoods over machining operations involving cutting fluids. Another example is the use of pumps to handle solvents rather than dumping manually from one container to another.
2. *Provide Exhaust Ventilation* — If the problem cannot be changed by the above techniques, can local exhaust ventilation be used to control the hazard? Exhaust ventilation is a very common solution to many health hazards, such as a spray paint booth or a vacuum hose on a grinder.
3. *Improve Housekeeping* — Will better housekeeping control the problem? For many operations, such as for lead dust in a storage battery manufacturing plant or for asbestos in brake shoe manufacturing, strict housekeeping is absolutely essential. Failure to have good housekeeping can cause the toxic materials to be reintroduced back into the air, bringing about additional and needless exposure. Of course, if possible, the toxic material is preferably contained before it has a chance to cause a housekeeping problem. Remember that vacuuming is the best method of cleaning dust — dry sweeping often makes the problem worse.
4. *Special Work Methods* — Wetting a dusty process, for example. The asbestos standard requires this.

c. Control at the worker.

1. *Provide Personal Protective Equipment* — When all else fails, are respirators, gloves, or aprons the only way to solve the problem? Good practice of industrial controls must be tried first and protective equipment used only as a last resort, but occasionally protective equipment is necessary (see next page).

2. *Administrative Controls* — Rotate hazardous jobs so that no worker is exposed a full shift for hazards like noise or heat, for which recovery periods can reduce health effects. (Be careful that for chemicals you do not just allow more workers to be exposed to repeated low levels when there are chronic effects.)

2. Personal protective equipment: solution or problem?

It is common sense that it is better to get a chemical out of the workplace than to rely on protective gear to shield the worker. This is especially true since personal protective equipment (PPE) presents so many problems of discomfort and inadequency, including:

- Often hot and uncomfortable (and not worn);
- Often ill-fitting, especially for women (usually designed for the average male body);
- May not be capable of providing adequate protection (many chemicals can permeate the types of materials used in protective clothing);
- Occasionally defective when manufactured, NIOSH has found much PPE defective;
- Hard hats, safety glasses, safety shoes, etc., can resist only so much pressure.

In addition, there is no standard of quality covering most PPE. The Environmental Protection Agency has recently developed a manual on PPE, which will soon become available. For copies contact EPA, 401 M Street, S.W., Room 3503, Washington, D.C. 20400.

a. **Respirators.** Of particular concern are respirators, since they are often the only barrier between a highly toxic contaminant and a worker's body. The bewildering array of respirators available is a problem, especially since having an appropriate one may be of life and death importance. But selection is not the only difficulty with respirators. Even the best respirator has limitations, such as:
    - Half masks and quarter masks allow eye and skin exposure;
    - Chemicals may get through overloaded cartridges or leaking facepieces, or the wrong cartridge may be used;
    - Fail to fit with a proper seal, especially on people with atypical face shapes or with facial hair.

Limitations are far greater if a respirator is not used as part of an excellent respirator program. As workers who wear them know, a good program is the exception rather than the rule. OSHA's respirator standard (1910.134) requires not only proper selection, but has detailed requirements for fit testing, training, monitoring, medical tests of a worker's ability to wear one, maintenance and storage. (In addition, some standards, such as asbestos, lead and vinyl chloride, have their own specific requirements.)

Without all of these provisions, respirators can cause more harm than provide protection, by creating a false sense of security. But even if appropriate respirators and a good program are in place, respirators are hot and uncomfortable, and many workers will take them off, especially in a hot environment. Other times workers may reoove them to talk, which in some cases is a safety precaution, as when one worker shouts a warning to another. Eight hours strapped silent and hot behind a mask is a lot to ask of an employee.

b. **A word on gloves.** Most people think a glove is a glove and one is as good as another. But laboratory testing over the past few years has shown large variation in permeability to different chemicals. The table in Appendix 2 shows one example of ratings assigned different glove materials by one research lab. Workers using gloves to protect against chemicals they know or suspect are hazardous should seek out the best glove available. Contact manufacturers for test results of their products.

3. What is OSHA's policy on personal protective equipment?

The policy (1910.132) simply states that PPE shall be "provided, used and maintained in a sanitary and reliable condition" wherever needed because of hazards. The section on respirators (1910.134) is more protective, stating that administrative or engineering controls should be implemented if feasible, before respirators are introduced. But companies (and recently OSHA too) argue that respirators are cheaper than engineering controls. Unions would do well to point out that while respirators are inexpensive, a fully compliant respirator program is quite costly.

A preventive approach

Hopefully this booklet will help you respond to workers' complaints and potentially hazardous chemicals in a systematic and thorough way.

Ongoing surveillance and improvement require the development of a committed and effective Health and Safety Committee. The main tasks it must take on regarding chemicals are:

1. **Chemical Surveys.**

This should include all workplace chemicals, including materials used for cleanup and other products used in maintenance, such as lubricating oils. Whatever way you make a chemical inventory is the right way: read labels, ask Purchasing or Shipping and Receiving.

2. **Workplace Inspections.**

Make a block diagram of the work area you are inspecting, and note clearly what you have seen and heard. To do a good job, you may have to inspect only parts of the workplace at one time; you may have to go back to a particular area several times. Your goal is a thorough understanding of the work that goes on in the area you have examined. Develop a checklist like the one in Appendix 1 for doing walk-through inspections.

3. **Research.**

Use the resources discussed in this booklet to find out about chemical effects and available controls.

4. **Action.**

Once you have evaluated the hazard through inspections, questions, and research, you must work out strategies for gaining improvements, such as engineering controls, contract language or protective equipment. Health and safety requires a lot of work, but it can protect your health and even save your life!

Appendix I
Chemical Hazard Inspection Checklist

Job title of worker: _____

Describe the task or job: _____

Chemical used (trade names): _____

Chemical names of contents if known: _____

Known health effects of chemicals:

Chemical _____ Effects _____

How often is the task or job done? _____

How long does it take? _____

What form(s) is the chemical in when worker contacts it? _____

What route(s) of entry does it appear to use to get into the body? _____

List any worker health complaints associated with this chemical: _____

_____

Do they correspond to known health effects? _____

Are there any patterns of problems in workers in this area, or workers who once worked there? _____

_____

Controls:

Describe any ventilation in place: _____

Are workers rotated? _____

Any personal protective equipment? _____

If respirators are used:

Appropriate cartridge? _____ Approved by NIOSH/MSHA? _____ Fit-tested before being assigned? _____ Workers medically tested for ability to wear them? _____ Leak tested by workers before each use? _____ Properly stored? _____ Properly maintained? _____ Is each worker assigned his/her own? _____

Housekeeping and Hygiene:

Are chemical spills cleaned up right away? _____ With proper protective gear? _____

Is toxic dust vacuumed or wet-swept? _____

Are there facilities for disposing of or laundering contaminated work clothing? _____

Who launders work clothes, worker or employee? _____

Are shower and changing facilities available? _____

If yes, is time allowed at the end of each shift to use them? _____

Appendix 2
Table of Glove Permeability

If workers seek manufacturers' or researchers' information on permeability they should be careful not to confuse it with glove *resistance*, which refers to withstanding corrosion and shrinkage (and does *not* necessarily correspond to permeability).

Extent of Solvent Penetration Through Glove Materials After 0.5 Hours

Solvent	Natural Rubber (0.4 mm)	Neoprene (0.4 mm)	Neoprene-Natural Rubber (0.5 mm)	Nitrile (0.4 mm)	Poly vinyl chloride (0.2 mm)	Poly vinyl alcohol* (0.4 mm)
Carbon Tetrachloride	D	D	D	A	D	A
Chloroform	D	D	D	D	D	A
Methylene Chloride	D	D	D	D	D	A
Methyl Iodide	D	D	D	D	D	A
1, 1, 2, 2-Tetrachloroethane	D	D	D	C	D	A
1, 1, 2-Trichloroethane	D	D	D	D	D	A
Perchloroethylene	D	D	D	A	D	A
Methanol	A	A	A	A	B	D
Ethanol	A	A	A	A	B	C
2-Propanol	A	A	A	A	B	B
n-Butanol	A	A	B	A	B	A
Benzene	D	D	D	C	D	A
Toluene	D	D	D	C	D	A
Aniline	A	A	A	C	D	A
Phenol (10% Water)	B	A	B	A	B	C
Acetone	B	C	B	D	D	A
Methyl Ethyl Ketone	C	D	C	D	D	A
Tetrahydrofuran	D	D	D	D	D	A
Dimethyl Sulfoxide	A	A	A	A	B	D
Dimethyl Formamide	B	A	A	C	D	D
Pyridine	C	C	C	D	D	C
Dioxane	B	B	B	A	D	A
n-Hexane	C	A	C	A	D	A
Water (H_2O)	A	A	A	A	A	D

A-excellent; B-good; C-fair; D-not recommended

*Gloves are not made of polyvinyl alcohol, because it dissolves in water or perspiration; rather gloves may be made of something else and coated with polyvinyl alcohol

Source: Sansone and Tewari, The Permeability of Laboratory Gloves to Selected Solvents, *Am. Ind. Hyg. Assoc. J.* 39: 169-174, Feb. 1978.

Another study which lists gloves by brand name and code number, but which was too long to include here is: "Glove Permeation by Organic Solvents" by G. Nelson and others, in the *American Industrial Hygiene Association Journal*, vol. 42, (March, 1981) pp. 217-225. Write for reprints: **AIHA, 475 Wolf Ledges Pkwy, Akron, OH 44311.**

Appendix 3
Request to Company for Information Under OSHA
Access to Employee Exposure Records Standard

Date

Dear (Name of Plant Manager):

Pursuant to Federal OSHA regulation 29 CFR Part 1910.20, OCAW Local _____ hereby requests that a copy of the following records be provided to the Union within 15 days:

1) all employee exposure records including all environmental (workplace) monitoring results, all biological monitoring results, and all material safety data sheets. For any toxic substance or physical agent for which these records do not exist, we request a list that identifies these substances or agents by their common generic or chemical name;
2) any analysis using these exposure records; and
3) any analysis using employee medical records.

Sincerely yours,

Local Union Official

Appendix 4
Comments on OSHA Standards: How protective are they?

Workers may believe that OSHA's standards for chemicals are "scientific" and protect workers' health. Actually this is not entirely true. First, OSHA's standards are designed to prevent acute effects, but may offer no protection against chronic ones. Second, the standards are meant to provide safe exposure limits for "average" healthy people. Therefore, people who are young, old, small, pregnant or unfit are less likely to be protected. Third, many standards represent political compromises. The research agency, NIOSH, recommends exposure levels based on the best available evidence. OSHA then begins a long standard-setting process involving hearings at which industry and labor representatives may testify. Therefore most OSHA standards are the result of a compromise between worker health and safety and employers' economic considerations. Recently the standard-setting process has nearly come to a halt. Instead, existing standards are being "withdrawn for review" which in nearly all cases means weakened.

Most standards were adopted in 1970 from recommended guidelines of an organization called the American Conference of Government Industrial Hygienists (ACGIH). The standards that the ACGIH recommends are expressed in terms of threshold limit values (TLVs). When OSHA adopts a TLV it becomes a legal limit rather than just a guideline, and is then called a permissible exposure level (PEL). ACGIH updates their standards every year, but OSHA has failed to do so mainly because of the cumbersome standard-setting process. Thus, most OSHA standards are years out of date.

For all these reasons, workers should regard OSHA's standards for chemicals as minimal.

The list of chemical standards may be found in the General Industry Standards, Section 1000, tables Z-1, Z-2, and Z-3. There are three types of PELs. These are the Time Weighted Average (TWA), the Ceiling Value (C), and Short Term Exposure Limit (STEL). These types of PELs are discussed in the General Standards just before the Z-tables. Read over these pages until you have a good understanding of permissible exposure.

Resource List

A thorough resource list plus excellent information on setting up a reference library on health and safety, may be found in: *Getting the Facts* by Susan Salisbury, Labor Occupational Health Program. Write LOHP, University of California at Berkeley, 2521 Channing Way, Berkeley, CA 94720.

BOOKS

1. *Work is Dangerous to Your Health* by Susan Daum, M.D. and Jeanne Stellman, Ph.D., Vintage Books, N.Y. A good general text for workers. Includes a section on hazards listed by occupation and a good section on stress.
2. *Clinical Toxicology of Commercial Products*, 4th ed., by Robert Gosselin, M.D., Ph.D., and others. Williams & Wilkins Co., Baltimore. A reference text which has many chemicals listed by trade names. Also lists the usual ingredients of general products such as glue, inks, paint, etc.
3. *Industrial Toxicology*, 3rd ed., Alice Hamilton, M.D. and Harriet Hardy, M.D., PSG Publishing Co., Inc., Littleton, MA. Detailed information on the effects of most common occupational chemicals.
4. *Chemical Hazards of the Workplace*, by James Hughes, J.D. and Nick Proctor, Ph.D., J.B. Lippincott Co., Philadelphia, 1978. A good series of articles on the effects of industrial chemicals. More expensive but more complete than reference number 1.
5. *Occupational Diseases: A Guide to Their Recognition*, NIOSH Pub. No. 77-181, Marcus Key, M.D. and others, editors. An inexpensive collection of articles on the effects of many common industrial chemicals, as well as symptoms and medical treatment.
6. *Occupational Health Guidelines for Chemical Hazards*, NIOSH Pub. No. 81-123, Mackison, Stricoff & Partridge, editors. Three large loose leaf volumes with excellent hazard and precaution information. Write NIOSH, Publications Dissemination, 4676 Columbia Parkway, Cincinnati, OH 45226.
7. Various publications of NIOSH: *Criteria Documents, Current Intelligence* and other publications on specific chemicals. Write for a 2-volume publications catalog (approximately $25). For address see item 6.

COMPUTER SERVICES

There are several computerized information banks on toxic chemicals, occupational cancer, etc., available through libraries of medical and public health schools, NIOSH and other places. They are usually very expensive however. Recently, the Workers' Institute for Safety and Health (WISH) has made most of these sources available at low cost. See page 6 of text for address and phone.

ORGANIZATIONS AND AGENCIES

(Sources of factsheets, audio visuals, education and technical assistance)

1. **Chicago Area Committee for Occupational Safety and Health** (CACOSH)

542 Dearborn, Room 508, Chicago, IL 60605 (312) 929-2104. Publish monthly newsletter often including factsheets, $3.00/year.

2. **Coalition of Labor Union Women** (CLUW)

Health Project, 15 Union Square, New York, N.Y. 10038 (212) 255-7800. Has developed several pamphlets on organizing for women.

3. **Labor Occupational Health Program**

Wide variety of publications on health and safety and other issues. Write for publications list. Address at top of *Resource List*.

4. **Massachusetts Coalition on Occupational Safety and Health** (MassCOSH)

120 Boylston Street, Room 206, Boston, MA 02116 (617) 482-4283. Publish bimonthly newsletter, often with factsheets and other items, $4.00/year. Write for publications list.

5. **National Institute for Occupational Safety and Health**

For address see item 6 under Books. Ask to be placed on their mailing list.

6. **OSHA**

Get a publications list from Federal OSHA. U.S. Department of Labor — OSHA, Publications, 200 Constitution Ave., N.W., Washington, D.C. 20210.

7. **Penn State University**

Labor Studies Department, 901 Liberal Arts Tower, University Park, PA 16802. 814-865-5425. Written materials, classes and technical assistance available.

8. **Philadelphia Project on Occupational Safety and Health** (PHILAPOSH)

3001 Walnut St., 5th Flr., Philadelphia, PA 19104 (215) 386-7000. Monthly newsletter often with factsheets, $5.00/year. Many other publications available.

9. **University of Wisconsin**

School for Workers, 701 Park-Regent Building, 1 South Park St., Madison, WI 53706 (608) 262-2111. Write for publications list. A large variety of pamphlets.

10. **Western Institute for Occupational and Environmental Sciences** (WIOES)

2520 Milvia St., Berkeley, CA 94704 (415) 845-6476. Send for publications list. Factsheets on many chemicals, emphasis on asbestos and other carcinogens.

11. **Women's Occupational Health Resource Center**

School of Public Health, Columbia University, 60 Haven Avenue, B-1, New York, N.Y. 10032 (212) 694-3464.

LABORATORIES

1. **UBTL**

A division of the University of Utah Research Institute, 520 Wakara Way, Salt Lake City, Utah 84108 (801) 581-8267. Frequently used by OSHA.

2. **Environmental Health Laboratory**

P.O. Box 6195, Macon, GA 31208 (800) 841-8919. Advertises 72-hour service guarantee and free mailers for samples supplied on request.

3. **Biospherics, Inc.**

4928 Wyaconda Road, Rockville, MD 20852 (301) 770-7700.

4. **Gannett-McCreath Laboratories**

Environmental Analytical Laboratory, P.O. Box 1963, Harrisburg, PA 17105 (717) 763-7211.

5. **MDS Laboratories**

4418 Pottsville Pike, Reading, PA 19605 (215) 921-9191.

6. **University of Cincinnati**

Kettering Laboratory, Analytical Section, 3223 Eden Ave., Cincinnati, OH 45267 (513) 872-5709.

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